Data Report on Fish Diets and Benthic Faunal Abundance and Diversity in the Somass River Estuary, Port Alberni, British Columbia

I. K. Birtwell, M. Wood, and D. K. Gordon

Department of Fisheries and Oceans
West Vancouver Laboratory
4160 Marine Drive
West Vancouver, British Columbia V7V 1N6

May 1983

Canadian Data Report of Fisheries and Aquatic Sciences No. 396

Canadian Data Report of Fisheries and Aquatic Sciences

These reports provide a medium for filing and archiving data compilations where little or no analysis is included. Such compilations commonly will have been prepared in support of other journal publications or reports. The subject matter of Data Reports reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries management, technology and development, ocean sciences, and aquatic environments relevant to Canada.

Numbers 1-25 in this series were issued as Fisheries and Marine Service Data Records. Numbers 26-160 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Data Reports. The current series name was changed with report number 161.

Data Reports are not intended for general distribution and the contents must not be referred to in other publications without prior written clearance from the issuing establishment. The correct citation appears above the abstract of each report.

Rapport statistique canadien des sciences halieutiques et aquatiques

Ces rapports servent de base à la compilation des données de classement et d'archives pour lesquelles il y a peu ou point d'analyse. Cette compilation aura d'ordinaire été préparée pour appuyer d'autres publications ou rapports. Les sujets des Rapports statistiques reflètent la vaste gamme des intérêts et politiques du Ministère des Pêches et des Océans, notamment gestion des pêches, techniques et développement, sciences océaniques et environnements aquatiques, au Canada.

Les numéros 1 à 25 de cette série ont été publiés à titre de Records statistiques, Service des pêches et de la mer. Les numéros 26-160 ont été publiés à titre de Rapports statistiques du Service des pêches et de la mer, Ministère des Pêches et de l'Environnement. Le nom de la série a été modifié à partir du numéro 161.

Les Rapports statistiques ne sont pas préparés pour une vaste distribution et leur contenu ne doit pas être mentionné dans une publication sans autorisation écrite préalable de l'établissement auteur. Le titre exact paraît au haut du résumé de chaque rapport.

Canadian Data Report of

Fisheries and Aquatic Sciences No. 396

May 1983

DATA REPORT ON FISH DIETS AND BENTHIC FAUNAL ABUNDANCE AND DIVERSITY IN THE SOMASS RIVER ESTUARY, PORT ALBERNI, BRITISH COLUMBIA.

by

I. K. Birtwell, M. Wood, and D. K. Gordon

Department of Fisheries and Oceans

West Vancouver Laboratory

4160 Marine Drive

West Vancouver,

British Columbia V7V 1N6

(c) Minister of Supply and Services Canada 1983

Cat. No. Fs 97-13/396 ISSN 0706-6465

LIST OF TABLE CAPTIONS

Table 1. Listing of the mean number of organisms (m^{-2}) obtained from duplicate benthic core samples. Data are presented by station, tidal zone and date. (N.S. signifies when a station was not sampled. No subtidal samples were taken from Station 11).

Table 2. Gut contents of chinook salmon (Oncorhynchus tshawytscha),the number of stomachs sampled, and the number of empty stomachs.

Table 3. Gut contents of chum salmon (Oncorhynchus keta), the number of stomachs sampled, and the number of empty stomachs.

Table 4. Gut contents of sockeye salmon (Oncorhynchus nerka), the number of stomachs sampled, and the number of empty stomachs.

Table 5. Gut contents of coho salmon (Oncorhynchus kisutch), the number of stomachs sampled, and the number of empty stomachs.

Table 6. Gut contents of steelhead trout (Salmo gairdneri), number of stomachs sampled, and the number of empty stomachs.

Table 7. Gut contents of Pacific staghorn scuplins (Leptocottus armatus), the number of stomachs sampled, and the number of empty stomachs.

Table 8. Gut contents of starry flounders (Platichthys stellatus), thenumber of stomachs sampled, and the number of empty stomachs.

Table 9. Gut contents of threespine sticklebacks (Gasterosteus aculeatus), the number of stomachs sampled, and the number of empty stomachs.

Table 10. Gut contents of shiner perch (Cymatogaster aggregata), the number of stomachs sampled, and the number of empty stomachs.

LIST OF FIGURE CAPTIONS

Figure 1. The location of sampling sites in the estuary of the Somass River, Port Alberni, British Columbia.

ABSTRACT

Birtwell, I. K., M. Wood, and D. K. Gordon. 1983. Data report on fish diets and faunal diversity in the Somass River Estuary, Port Alberni, British Columbia. Can. Data Rep. Fish. Aquat. Sci. 396: v + 33 p.

Data are presented on the abundance and diversity of benthic intertidal and upper subtidal fauna obtained from stations on the Somass River estuary. In addition beach seines at these stations provided specimens of nine species of fish whose gut contents were identified and enumerated. The objective of the study was to determine if spatial differences in benthic species composition and abundance, and in fish diet could be related to activities which impinge upon fish habitat in the estuary.

Key words: estuary, pulp mill effluent, salmonid diets, intertidal fish diet, Somass estuary, Alberni Inlet.

RÉSUMÉ

Birtwell, I. K., M. Wood, and D. K. Gordon. 1983. Data report on fish diets and faunal diversity in the Somass River Estuary, Port Alberni, British Columbia. Can. Data Rep. Fish. Aquat. Sci. 396: v + 33 p.

Le présent rapport porte sur l'abondance et la diversité de la faune benthique peuplant la zone intertidale et la partie supérieure de la zone infratidale, données recueillies à des stations dans l'estuaire de la rivière Somass. De plus, des échantillons de neuf espèces de poissons, dont les contenus stomacaux ont été identifiés et les éléments comptés, ont été capturés aux mêmes endroits à l'aide de sennes de rivage. Cette étude vise à déterminer si les différences spatiales dans la composition et l'abondance des espèces benthiques et dans la nourriture des poissons sont reliées aux activités qui empiètent sur l'habitat du poisson dans l'estuaire.

Mots-clés: estuaire, effluent d'usine de pâte, nourriture des salmonidés, nourriture des poissons intertidaux, estuaire de la Somass, inlet Alberni.

INTRODUCTION

The Somass River drains into the headwaters of Alberni Inlet, situated on the west coast of Vancouver Island, British Columbia (Fig. 1). Municipal and industrial development has occurred adjacent to the Somass estuary, thus placing a demand upon the intertidal zone and estuarine waters. Large volumes of pulp mill effluent (ca. 180×10^3 m^3) are discharged into the upper waters of the estuary daily (Birtwell 1978). This effluent tends to remain above the halocline due to water density conditions (Parker and Sibert 1973) entrainment and the highly stratified nature of the inlet (Tully 1949). Other studies have also dealt with the physical/chemical aspects of the oceanography of Alberni Inlet and the distribution of pulp mill effluent (e.g. Waldichuk 1956; Werner and Hyslop 1967).

Baseline information on the biological communities of Alberni Inlet prior to heavy industrialization are non-existant. However, a few recent investigations have been made of the invertebrate and fish communities and their responses to pulp mill effluent (Kask and Parker 1972; Harger et al. 1973; Ketcham 1976; Birtwell 1978). A study of the effects of dredging and dumping operations on the benthic fauna of Alberni Inlet has also been completed (Levings et al. 1983).

This study looks at differences in occurrence, abundance and distribution of the benthic invertebrate community of the Somass estuary and the importance of some of these species as prey items to nine species of fish, including five species of salmonid.

MATERIALS AND METHODS

I. Benthic Faunal Survey

Benthic sediment samples (3 cm x 7.5 cm in diameter) were obtained, using a plastic corer, and immediately placed in 1L plastic bottles containing 10% buffered formalin. Duplicate samples were taken from four tidal heights (upper intertidal, mid intertidal, low intertidal and sub-tidal) at five stations (Fig. 1) on a bi-weekly basis during June and July, 1975. Station 16 was located on the west side of Alberni harbour, Station 10 was adjacent two small islands in the mud flat area. Station 5 was situated in the marsh region and Station 4 at Lupsi Cupsi Point, just off the pulpmill complex. Station 11 was on the highly industrialized side of the harbour within the confines of a wharf.

Samples were exposed to Rose Bengal for 24 hours prior to sorting. Although several sophisticated techniques for separating organisms from sediments exist (e.g. sorting tubes, water jets, density

gradient solutions) a simple panning/decanting method was found to be effective. The sample was washed through a large mesh sieve to remove rocks and organic debris then placed in an enamel tray which was filled with water, panned and decanted off into a 0.25 mm cloth mesh. The latter step was repeated several times until all organisms had been washed into the mesh (this was ensured by scanning the remaining sediment under a dissecting microscope).

Large samples were subsampled using a plankton splitter however, in most cases the entire sample was examined under a dissecting microscope. Organism were hand picked using fine-point forceps, identified and enumerated. Only whole organisms, or parts making up whole animals, were counted. To facilitate the identification of those soft bodied organisms whose internal structure needs to be seen, specimens were placed in 95% ethyl alcolhol to remove the Rose Bengal.

II. Fish Diet Study

Beach seining was carried out on a bi-weekly basis over a three month period beginning in May, 1975. Sampling was conducted over a two hour interval around high tides of 3.0±0.4 m, at the same sites from which benthic samples were obtained. A 30.5 x 1.8 m beach seine was deployed from a 6.3 m jet-driven boat. Fish captured were preserved in 10% buffered formalin and their stomachs later removed in the laboratory where the number and types of organisms in each gut were determined.

ACKNOWLEDGMENTS

The assistance of R. Harbo, R. Taylor, G. Carlson and A. Cowan during sample collection is appreciated. Donna Price and Geneva McLaren typed the manuscript.

REFERENCES

Birtwell, I.K. 1978. Studies on the relationship between juvenile chinook salmon and water quality in the industrialized estuary of the Somass River. In: "Proceedings of the 1977 Northeast Pacific Chinook and Coho Salmon Workshop". Sheperd, B.G., and R.M.J. Ginetz (Eds.). Fish. Mar. Ser. Tech. Rep. 759: 58-59.

Harger, J.R.E., M.L. Campbell, R. Ellison, W.P. Lock, and W. Zwarych. 1973. A experimental investigation into effects of pulp mill effluent on structure of biological communities in Alberni Inlet, British Columbia. Part 2; Intertidal Communities. Intern. J. Environmental Studies 5: 13-19.

Kask, B.A., and R. Parker. 1972. Observations of juvenile chinook salmon in the Somass River estuary, Port Alberni, British Columbia. Fish. Mar. Ser. Tech. Rep. 308: 15.

Ketcham, D. 1977. Chemical and bilogical surveys of Alberni Pulp and Paper Division receiving waters. Part 2. The baseline years (1974-1976). MacMillan Bloedel(Alberni) Limited, Alberni Pulp and Paper Division Tech Rep. 124: 92.

Levings, C.D., E.P. Anderson, and G.W. O'Connell. 1983. Biological effects of dredge spoil disposal in Alberni Inlet, British Columbia: spatial and temporal aspects. (manuscript).

Parker, R., and J. Sibert. 1973. Effects of pulpmill effluent on dissolved oxygen in a stratified estuary-I Empirical Observations. Water Research 7(4): 503-514.

Tully, J.P. 1949. Oceanography and prediction of pulpmill pollution in Alberni Inlet. J. Fish. Res. Bd. Canada, Bull., 83: 169.

Waldichuk, M. 1956. Pulp mill pollution in Alberni Harbour, British Columbia. Sewage and Industrial Wastes, 28: 199-205.

Werner, A.E., and W.F. Hyslop. 1967. Distribution of kraft mill effluent in a British Columbia harbour. J. Fish. Res. Bd. Canada, 24(10): 2137-2153.

Table 1. Listing of the mean number of organisms (m^{-2}) obtained from duplicate benthic core samples. Data are presented by station, tidal zone and date. (N.S. signifies when a station was not sampled. No subtidal samples were from Station 11).

Station 4
Tidal Zone: Upper-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus				
Eogammarus sp. juvenile				
Corophium brevis				
C. salmonis				
C. spinicorne				
Corophium juvenile				
Corophium sp.				
Orchestia traskiana				
Calanoida				
Cyclopoida				
Harpacticoida				
Gnorimosphaeroma oregonensis				
Ostracoda				
Tanaidacea				
Acarina			226	
Chironomid larvae				
Chironomid pupae				
Coleoptera larvae				
Collembola				
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta	226			
Insect larvae				
Littorina sp.				
Oligochaeta		339	226	
Capitella sp.				
Nereis wailui				
Nereis sp.				
Nematoda	226		226	
Formaminifera				
Tardigrada				
Total	452	339	678	0
# of taxa	2	1	3	0

Station 4
Tidal Zone: Mid-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus	904	2260		
Eogammarus sp. juvenile				
Corophium brevis	2373	452		
C. salmonis				
C. spinicorne		678		
Corophium juvenile				
Corophium sp.		226		
Orchestia traskiana				
Calanoida				
Cyclopoida				
Harpacticoida	58873	10848		
Gnorimosphaeroma oregonensis	2034			3503
Ostracoda				
Tanaidacea				
Acarina			113	
Chironomid larvae				
Chironomid pupae				
Coleoptera larvae				
Collembola				
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta				
Insect larvae	339	2034		
Littorina sp.				
Oligochaeta	118763	55370	16611	2825
Capitella sp.				
Nereis wailui	226			
Nereis sp.				
Nematoda	52997	16272	2034	2260
Formaminifera				
Tardigrada				
Total	236,509	88,140	18,758	8,588
# of taxa	8	8	3	3

Station 4
Tidal Zone: Low-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus	3051		2599	678
Eogammarus sp. juvenile			9266	
Corophium brevis	113			
C. salmonis				
C. spinicorne	565		565	
Corophium juvenile	452		4520	
Corophium sp.				
Orchestia traskiana				
Calanoida				
Cyclopoida				
Harpacticoida	8362		4294	
Gnorimosphaeroma oregonensis	1356		791	2147
Ostracoda				
Tanaidacea				
Acarina				
Chironomid larvae				
Chironomid pupae				
Coleoptera larvae				
Collembola				
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta				
Insect larvae	226		2147	
Littorina sp.				
Oligochaeta	17516	15255	8249	565
Capitella sp.				
Nereis wailui	339			
Nereis sp.				
Nematoda	12656	5311	3390	24634
Formaminifera				3729
Tardigrada				
Total	44,636	20,566	35,821	31,753
# of taxa	10	2	9	5

Station 4
Tidal Zone: Subtidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus		2034	4181	
Eogammarus sp. juvenile				
Corophium brevis		339		
C. salmonis				
C. spinicorne		113		
Corophium juvenile				
Corophium sp.		565	339	
Orchestia traskiana				
Calanoida				
Cyclopoida				
Harpacticoida		1582	2599	
Gnorimosphaeroma oregonensis		113	2486	
Ostracoda				
Tanaidacea			113	
Acarina				
Chironomid larvae				
Chironomid pupae		452		
Coleoptera larvae				
Collembola				
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta				
Insect larvae		2034	113	
Littorina sp.				
Oligochaeta	13786	3955	28702	
Capitella sp.				
Nereis wailui			226	
Nereis sp.				
Nematoda	452	1695	4068	
Formaminifera				
Tardigrada				
Total	14,238	12,882	42,827	N.S.
# of taxa	2	10	9	

Station 5
Tidal Zone: Upper-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus				
Eogammarus sp. juvenile				
Corophium brevis				
C. salmonis				
C. spinicorne				
Corophium juvenile			113	
Corophium sp.				
Orchestia traskiana				
Calanoida				
Cyclopoida				
Harpacticoida				
Gnorimosphaeroma oregonensis				
Ostracoda				
Tanaidacea				
Acarina	113	113		
Chironomid larvae				
Chironomid pupae				
Coleoptera larvae				113
Collembola		113		
Diptera		791		
Dipteran pupae				
Hymenoptera				
Insecta				
Insect larvae				
Littorina sp.				
Oligochaeta	339	904	113	14690
Capitella sp.				
Nereis wailui				
Nereis sp.				
Nematoda				
Formaminifera				226
Tardigrada				
Total	452	1921	226	15,029
# of taxa	2	4	2	3

Station 5
Tidal Zone: Mid-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus				1130
Eogammarus sp. juvenile				
Corophium brevis				1469
C. salmonis				113
C. spinicorne				565
Corophium juvenile				226
Corophium sp.				
Orchestia traskiana				
Calanoida				
Cyclopoida				339
Harpacticoida				9718
Gnorimosphaeroma oregonensis				6554
Ostracoda				
Tanaidacea				
Acarina				
Chironomid larvae				
Chironomid pupae				
Coleoptera larvae				
Collembola				
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta				113
Insect larvae				
Littorina sp.				
Oligochaeta	7345	10057	4407	19097
Capitella sp.				
Nereis wailui				
Nereis sp.				
Nematoda	678	113	7911	
Formaminifera				565
Tardigrada				
Total	8,023	10,170	5,198	39,889
# of taxa	2	2	2	11

Station 5
Tidal Zone: Low-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus		678		565
Eogammarus sp. juvenile				
Corophium brevis			113	1582
C. salmonis				4294
C. spinicorne	113	678	113	
Corophium juvenile	113	226	113	21357
Corophium sp.	226	113		794
Orchestia traskiana				
Calanoida				
Cyclopoida	113	226		
Harpacticoida	1469	1017	226	4972
Gnorimosphaeroma oregonensis		452	113	226
Ostracoda				
Tanaidacea				
Acarina	113			
Chironomid larvae	226	113		339
Chironomid pupae				
Coleoptera larvae			226	
Collembola				
Diptera			113	
Dipteran pupae				
Hymenoptera				
Insecta				
Insect larvae				
Littorina sp.				
Oligochaeta	5876	4520	4294	9153
Capitella sp.				
Nereis wailui				
Nereis sp.	113	113		1582
Nematoda	2486	4181	1695	23956
Formaminifera				
Tardigrada				
Total	10,848	12,317	7,006	68,820
# of taxa	10	11	9	11

Station 5
Tidal Zone: Subtital

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus	339		113	
Eogammarus sp. juvenile				
Corophium brevis			113	3277
C. salmonis				
C. spinicorne	113		339	
Corophium juvenile	113	113	5763	
Corophium sp.			113	
Orchestia traskiana				
Calanoida				
Cyclopoida	226			
Harpacticoida	339	113	1243	
Gnorimosphaeroma oregonensis				
Ostracoda	113			
Tanaidacea				
Acarina				
Chironomid larvae			113	
Chironomid pupae				
Coleoptera larvae				
Collembola				
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta				
Insect larvae				
Littorina sp.				
Oligochaeta	37064	3164	1695	
Capitella sp.				
Nereis wailui				
Nereis sp.		113	113	
Nematoda	2938	904	7797	
Formaminifera		565	226	
Tardigrada				
Total	41,245	5,085	20,792	N.S.
# of taxa	8	7	11	

Station 10
Tidal Zone: Upper-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus				
Eogammarus sp. juveniles				
Corophium brevis				
C. salmonis				
C. spinicorne				
Corophium juvenile				
Corophium sp.				
Orchestia traskiana				
Calanoida				
Cyclopoida				
Harpacticoida		339		113
Gnorimosphaeroma oregonensis				
Ostracoda	452			
Tanaidacea				
Acarina	678	339		452
Chironomid larvae	678	113	3390	
Chironomid pupae			904	
Coleoptera larvae				
Collembola				
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta				113
Insect larvae		113		
Littorina sp.	678	678	226	
Oligochaeta	1356	3277		10396
Capitella sp.				
Nereis wailui				
Nereis sp.				
Nematoda	12430	1469	1130	339
Formaminifera	302840	19210	237300	
Tardigrada	226	113		
Total	319,338	25,651	242,950	11,413
# of taxa	8	9	5	5

Station 10
Tidal Zone: Mid-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus	2486		2034	1386
Eogammarus sp. juveniles				
Corophium brevis			452	678
C. salmonis				2034
C. spinicorne	452		2147	
Corophium juvenile	678		565	3164
Corophium sp.				
Orchestia traskiana				
Calanoida				
Cyclopoida				
Harpacticoida	5650	2825	14465	11300
Gnorimosphaeroma oregonensis	2825	1130	31075	8927
Ostracoda				
Tanaidacea			113	113
Acarina	11300		452	
Chironomid larvae			2373	
Chironomid pupae				
Coleoptera larvae				
Collembola				
Diptera				
Dipteran pupae			226	
Hymenoptera				
Insecta				
Insect larvae				452
Littorina sp.		113		
Oligochaeta	34239	48816	42036	22148
Capitella sp.				
Nereis wailui				
Nereis sp.	339		339	339
Nematoda	5650	8475	3164	16950
Formaminifera				
Tardigrada				
Total	63,619	61,359	99,441	67,461
# of taxa	9	5	13	11

Station 10
Tidal Zone: Low-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus	3390		904	226
Eogammarus sp. juveniles	34352			
Corophium brevis		2260	4746	12656
C. salmonis	2260	6328	226	678
C. spinicorne	1130		452	2486
Corophium juvenile	41810	32544	3164	8588
Corophium sp.			565	3616
Orchestia traskiana				
Calanoida				
Cyclopoida				
Harpacticoida	22600	27572	3842	2260
Gnorimosphaeroma oregonensis			339	452
Ostracoda		1356		
Tanaidacea				
Acarnia				
Chironomid larvae	226	904		4520
Chironomid pupae				226
Coleoptera larvae				
Collembola				
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta				
Insect larvae				
Littorina sp.				
Oligochaeta	23052	10848	4294	16950
Capitella sp.				
Nereis wailui				
Nereis sp.		1356	904	1130
Nematoda	15820	90852	39550	13334
Formaminifera				
Tardigrada				
Total	144,640	174,020	58,986	67,122
# of taxa	9	9	11	13

Station 10
Tidal Zone: Subtidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus		565		
Eogammarus sp. juveniles				
Corophium brevis				
C. salmonis			2486	
C. spinicorne	226		2486	
Corophium juvenile	113		33448	
Corophium sp.				
Orchestia traskiana				
Calanoida				
Cyclopoida				
Harpacticoida	452	1695	7232	
Gnorimosphaeroma oregonensis				
Ostracoda			1130	
Tanaidacea				
Acarina				
Chironomid larvae	113		1808	
Chironomid pupae			226	
Coleoptera larvae				
Collembola				
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta				
Insect larvae				
Littorina sp.				
Oligochaeta	2034	9605	7232	
Capitella sp.				
Nereis wailui				
Nereis sp.	339	565	3164	
Nematoda	791	5311	11300	
Formaminifera				
Tardigrada				
Total	4,068	17,741	70,512	N.S.
# of taxa	7	5	10	

Station 11
Tidal Zone: High-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus				
Eogammarus sp. juveniles				
Corophium brevis				
C. salmonis				
C. spinicorne				
Corophium juvenile				
Corophium sp.				
Orchestia traskiana				
Calanoida				
Cyclopoida				
Harpacticoida	113	339	565	565
Gnorimosphaeroma oregonensis				
Ostracoda				
Tanaidacea				
Acarina		1808		113
Chironomid larvae				226
Chironomid pupae				
Coleoptera larvae				
Collembola		1243	113	
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta				
Insect larvae				
Littorina sp.				
Oligochaeta	5537	45426	20679	23617
Capitella sp.				
Nereis wailui				
Nereis sp.				
Nematoda	1469	13447	3164	17402
Formaminifera	1582	7910	13560	18080
Tardigrada				
Total	8,701	70,173	38,081	60,003
# of taxa	4	6	5	6

Station 11
Tidal Zone: Mid-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus				
Eogammarus sp. juveniles				
Corophium brevis				
C. salmonis				
C. spinicorne				
Corophium juvenile				
Corophium sp.				
Orchestia traskiana				
Calanoida				
Cyclopoida				
Harpacticoida	6328	2486	7232	678
Gnorimosphaeroma oregonensis	226	226		226
Ostracoda				
Tanaidacea				
Acarnia			565	113
Chironomid larvae				
Chironomid pupae				
Coleoptera larvae				
Collembola				
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta				
Insect larvae				
Littorina sp.				
Oligochaeta	8927	8362	2712	10622
Capitella sp.				
Nereis wailui				
Nereis sp.			113	
Nematoda	2712	15311	1300	7684
Formaminifera	452		452	
Tardigrada				
Total	18,645	16,385	22,374	19,323
# of taxa	5	4	6	5

Station 11
Tidal Zone: Low-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus				
Eogammarus sp. Juvenile				
Corophium brevis				
C. salmonis				
C. spinicorne				
Corophium juvenile				
Corophium sp.				
Orchestia traskiana				
Calanoida				
Cyclopoida	226			226
Harpacticoida	2147	226	113	565
Gnorimosphaeroma oregonensis				113
Ostracoda				
Tanaidacea				
Acarnia				
Chironomid larvae				
Chironomid pupae				
Coleoptera larvae				
Collembola				
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta				
Insect larvae				
Littorina sp.				
Oligochaeta	6780		719	452
Capitella sp.				
Nereis wailui				
Nereis sp.				
Nematoda	3616	1130	1808	339
Formaminifera		226		
Tardigrada				
Total	12,769	1,582	2,640	1,695
# of taxa	4	3	3	5

Station 16
Tidal Zone: Upper-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus				
Eogammarus sp. Juvenile				
Corophium brevis				
C. salmonis				
C. spinicorne				
Corophium juvenile				
Corophium sp.				
Orchestia traskiana		226		
Calanoida				
Cyclopoida				
Harpacticoida	452			
Gnorimosphaeroma oregonensis				
Ostracoda	4294	678		
Tanaidacea				
Acarnia	452	113		452
Chironomid larvae	226	3616		452
Chironomid pupae				
Coleoptera larvae				
Collembola		1356	226	904
Diptera				
Dipteran pupae			113	
Hymenoptera			113	
Insecta			226	
Insect larvae		1130		
Littorina sp.				
Oligochaeta	4520	452	6554	4972
Capitella sp.				
Nereis wailui				
Nereis sp.				
Nematoda	10170	6215	3051	1808
Formaminifera	90852	108028	54127	
Tardigrada		339		
Total	110,966	122,153	64,410	9,040
# of taxa	7	10	7	6

Station 16
Tidal Zone: Mid-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus				
Eogammarus sp. Juvenile				
Corophium brevis	2034			
C. salmonis				
C. spinicorne	2486			
Corophium juvenile	2486			226
Corophium sp.				
Orchestia traskiana				
Calanoida				
Cyclopoida				
Harpacticoida	25538	904		1243
Gnorimosphaeroma oregonensis				113
Ostracoda	2486		452	565
Tanaidacea				
Acarnia				226
Chironomid larvae				
Chironomid pupae				
Coleoptera larvae				
Collembola				
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta				
Insect larvae				
Littorina sp.				
Oligochaeta	17854	339	226	113
Capitella sp.				
Nereis wailui				
Nereis sp.				
Nematoda	16498	1017	904	1130
Formaminifera	121588	282500	293800	282500
Tardigrada				
Total	190,970	284,760	295,382	286,116
# of taxa	8	4	4	8

Station 16
Tidal Zone: Low-Intertidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus	226	11752	904	2825
Eogammarus sp. Juvenile			904	
Corophium brevis	3842	13108	6554	4068
C. salmonis	226	904	678	339
C. spinicorne	1808	1808		226
Corophium juvenile	10170	7684	1808	1695
Corophium sp.				
Orchestia traskiana				
Calanoida			452	
Cyclopoida			226	
Harpacticoida	6780	9492	1356	
Gnorimosphaeroma oregonensis				1921
Ostracoda	452			
Tanaidacea				
Acarnia	226			
Chironomid larvae				3277
Chironomid pupae				
Coleoptera larvae				
Collembola				
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta				
Insect larvae	678			
Littorina sp.				
Oligochaeta	5198	4068	11074	2599
Capitella sp.				
Nereis wailui	226			
Nereis sp.		1808	226	565
Nematoda	35050	9492	2486	16046
Formaminifera	1582		87010	28250
Tardigrada				
Total	66,444	60,116	113,678	61,811
# of taxa	13	9	12	11

Station 16
Tidal Zone: Subtidal

Taxa/Date	75/06/09	75/06/24	75/07/09	75/07/24
Eogammarus confervicolus		1582		
Eogammarus sp. Juvenile				
Corophium brevis	1356	452	904	
C. salmonis	226		226	
C. spinicorne	678	452		
Corophium juvenile	565	339	1130	
Corophium sp.				
Orchestia traskiana				
Calanoida				
Cyclopoida				
Harpacticoida	2712		5424	
Gnorimosphaeroma oregonensis		226	113	
Ostracoda				
Tanaidacea				
Acarina				
Chironomid larvae		226	339	
Chironomid pupae				
Coleoptera larvae				
Collembola		113		
Diptera				
Dipteran pupae				
Hymenoptera				
Insecta				
Insect larvae				
Littorina sp.				
Oligochaeta	3164	8701	16046	
Capitella sp.	791	1130	1356	
Nereis wailui				
Nereis sp.				113
Nematoda	1356	16492	565	
Formaminifera	1017		452	
Tardigrada				
Total	11,865	29,713	26,668	N.S.
# of taxa	9	10	11	

Table 2. Gut contents of chinook salmon (Oncorhynchus tshawytscha), the number of stomachs sampled, and the number of empty stomachs.

Taxa/Station	16	10	4	5	11
Eogammarus confervicolus	62	180	126	132	1
Orchestia traskiana	1				
Corophium sp.	46	45	6	14	1
C. brevis	23		9		
C. salmonis	2	33	6	7	
C. spinicorne	96	77	4	33	
Corophium juveniles			2	23	
Unidentified amphipoda				8	
Gnorimosphaeroma oregonensis	11	3	3	36	23
Mysidacea	1	5	2	10	
Arachnida	1		1	2	
Chiromonid larvae	35	31	40	9	6
Chiromonid pupae	16	8	258	1	90
Coleoptera	4				7
Coleoptera larvae	3	1		1	6
Collembola		5		1	1
Diptera	42	24	16	47	35
Hemiptera		8		1	1
Homoptera	1		2		6
Hymenoptera	6	1	1	6	6
Simulidae larvae			1		
Tipulidae larvae			1		
Thysanoptera				1	
Tricoptera			1		
Psocoptera	32	33	2	166	10
Pseudoscorpionida					1
Unidentified insecta (adult)	3	5	1	24	38
Unidentified insect larvae	1	1			
Oligochaeta	1		18		379
Nereis sp.			1		
Unidentified polychaeta		4	1	1	
Nematoda					2
Unidentified larval fish	1				
Total	388	464	502	523	613
# of taxa	21	17	22	20	17
# of stomachs	88	82	73	83	82
# of empty stomachs	16	6	12	7	7

Table 3. Gut contents of chum salmon (Oncorhynchus keta), the number of stomachs sampled, and the number of empty stomachs.

Taxa/Station	16	10	4	5	11
Eogammarus confervicolus		15		3	
Corophium sp.	3	1		5	1
C. brevis	1				
C. spinicorne	2				
Corophium juveniles	2		8	44	
Gnorimosphaeroma oregonensis				1	
Harpacticoida		2		159	
Anastanais normani			1		
Mysidacea	1		1		
Chiromonid larvae	10	9	4	4	2
Chiromonid pupae	5	3		2	
Collembola	1	2	1	1	1
Diptera (adult)	19	14	5	11	
Homoptera	1				
Hymenoptera					1
Psocoptera	3				
Ceratopogonidae larvae		1			1
Unidentified insecta	7		2	2	3
Arachnida					1
Oligochaeta	1		55		
Polychaeta	1				
Total	57	47	77	232	10
# of taxa	14	8	8	10	7
# of stomachs	19	9	7	13	7
# of empty stomachs	1	1	0	4	0

Table 4. Gut contents of sockeye salmon (Oncorhynchus nerka), the number of stomachs sampled, and the number of empty stomachs.

Taxa/Station	16	10	4	5	11
Eogammarus confervicolus	2				
Corophium sp.	1	10	1		
C. brevis	1				
C. spinicorne	2				
Unidentified amphipoda	2				
Harpacticoida		11			
Mysidacea	1	1	1		
Chiromonid larvae	1	1	3	5	
Chiromonid pupae	5				
Diptera	5	2	6	1	
Homoptera		1			
Psocoptera	1	3	21		
Unidentified insecta	3	1	3	6	
Oligochaeta			10		
Unidentified larvae fish			2		
Total	24	30	47	12	0
# of taxa	11	8	8	3	
# of stomachs	15	19	22	24	5
# of empty stomachs	3	10	1	9	5*

* all five specimens had a small amount of unidentifiable digested food material present.

Table 5. Gut contents of coho salmon (Oncorhynchus kisutch), the number of stomachs sampled, and the number of empty stomachs.

Taxa/Station	16	10	4	5	11
Eogammarus confervicolus		110	2	88	
Corophium sp.		8	1	3	
C. brevis		1			
C. salmonis		7	4		
C. spinicorne		22			
Corophium juveniles				1	
Gnorimosphaeroma oregonensis		9		20	
Chiromonid larvae	4				
Chiromonid pupae		1	1		
Collembola	1				
Hemiptera		1			
Hymemoptera				14	
Pscocoptera	3				
Unidentified insecta			1		
Unidentified polychaeta			1		
Unidentified fish				1	
Total	8	159	10	127	0
# of taxa	3	8	6	6	0
# of stomachs	1	5	3	5	0
# of empty stomachs	0	0	0	0	0

Table 6. Gut contents of steelhead trout (Salmo gairdneri), the number of stomachs sampled, and the number of empty stomachs.

Taxa/station	16	10	4	5	11
Eogammarus confervicolus	7	2	16		
Corophium sp.	1	19		1	
C. spinicorne				1	
Unidentified amphipoda	2			1	
Gnorimosphaeroma oregonensis		1		1	
Harpacticoida	18	44	1		
Chiromonid larvae		2			
Chiromonid pupae		1			
Diptera		4			
Homoptera		1			
Nematoda				2	
Unidentified fish			1		
Total	28	74	18	6	0
# of taxa	4	8	3	5	0
# of stomachs	4	16	2	3	0
# of empty stomachs	0	4	0	2	0

Table 7. Gut contents of Pacific staghorn sculpins (Leptocottus armatus), the number stomachs sampled, and the number of empty stomachs.

Taxa/Station	16	10	4	5	11
Eogammarus confervіolus	23	82	6	6	8
Corophium sp.	15	16	1	1	
C. salmonis	10	5		67	
C. spinicorne	3	5		49	1
Corophium juveniles		3			
Unidentified amphipoda	4	1	10	5	
Gnorimosphaeroma oregonensis	37	1	3	75	95
Calanoida					110
Mysidacea		6		1	1
Ostracoda				3	
Chironomid larvae	2		2		145
Chironomid pupae				1	6
Coleoptera larvae					7
Dipteran larvae					40
Ceratopogonidae					29
Unidentified insecta	1		1		2
Littorina sp.					50
Oligochaeta					49
Nematoda				1	10
Unidentified eggs	44			5	4
Total	139	119	24	213	557
# of taxa	9	8	7	10	15
# of stomachs	18	14	13	23	68
# of empty stomachs	0	0	0	3	7

Table 8. Gut contents of starry flounders (Platichthys stellatus), the number of stomachs sampled, and the number of empty stomachs.

Taxa/Station	16	10	4	5	11
Eogammarus confervicolus	19	33	101		
Corphium sp.	1		2		
Unidentified amphipoda		1			
Gnorimosphaeroma oregonensis	17	14	73		2
Calanoida					16
Mysidacea (larvae)		1	1		
Chiromonid larvae			34		
Chiromonid pupae			2		
Diptera larvae					1
Ceratopogonidae larvae					10
Acarina					1
Oligochaeta					63
Total	37	49	213	0	93
# of taxa	3	4	6	0	6
# of stomachs	2	6	8	1	16
# of empty stomachs	0	0	2	1	0

Table 9. Gut contents of threespine sticklebacks (Gasterosteus aculeatus), the number of stomachs sampled, and the number of empty stomachs.

Taxa/Station	16	10	4	5	11
Eogammarus confervicolus	26	49	4		3
Corophium sp.	9	27			
C. brevis	1				
C. salmonis		2	1		
C. spinicorne	2	1			
Corophium juveniles		4		3	
Unidentified amphipoda	1	5		1	
Gnorimosphaeroma oregonensis					1
Calanoida	162	56			
Harpacticoida	3	4	2		28
Mysidacea		30	1	1	3
Mysidacea (larvae)		59			38
Ostracoda		1			
Anastanais normani					3
Chiromonid larvae	3	134	503	102	122
Chiromonid pupae		19	66		6
Diptera		2	78	4	
Dipteran larvae					9
Ceratopogonidae larvae		8		1	54
Unidentified insecta		1	3		
Acarina					1
Littorina sp.				14	
Oligochaeta		2	90		18
Unidentified polychaeta		10	2		
Nematoda		2	20	2	34
Unidentified eggs	2	30	5	20	2
Total	209	446	775	148	322
# of taxa	9	20	12	9	14
# of stomachs	32	57	39	14	50
# of empty stomachs	4	3	2	2	9

Table 10. Gut contents of shiner perch (Cymatogaster aggregata), the number stomachs sampled, and the number of empty stomachs.

Taxa/Station	16	10	4	5	11
Eogammarus confervicolus	1				
Unidentified amphipoda		3	2		
Corophium sp.			1		
Gnorimosphaeroma oregonensis	27	4	1		
Mysidacea		4			
Chiromonid larvae			352		
Diptera			2		
Unidentified insecta			3		
Polychaeta		1	1		
Total	28	12	362	0	0
# of taxa	2	4	7	0	0
# of stomachs	12	19	19	2	2
# of empty stomachs	2	3	1	1	0

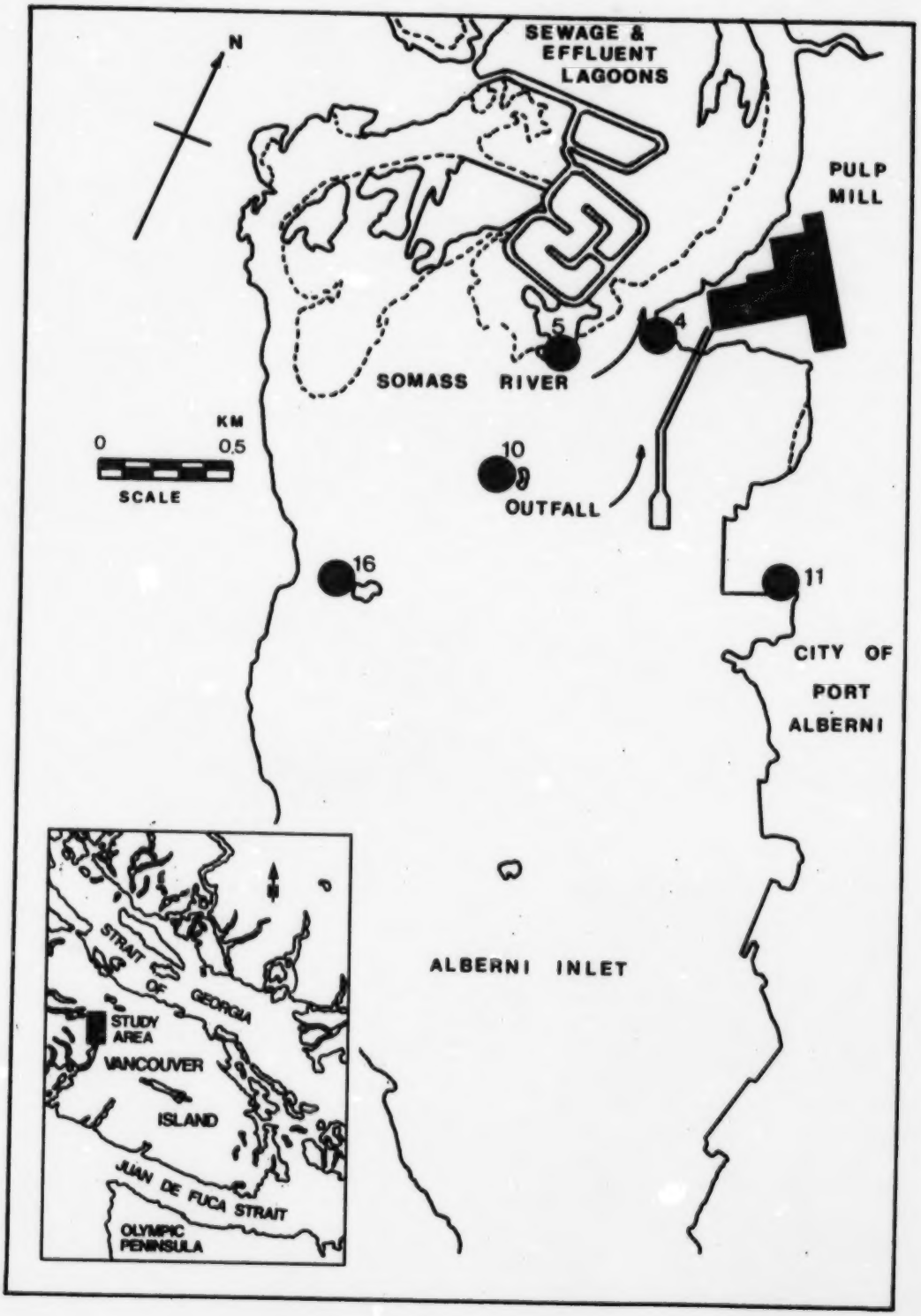

Fig. 1. The location of sampling sites in the estuary of the Somass River, Port Alberni, British Columbia.